**Express Mail Label No. ET034069342**
**PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| In the **PATENT APPLICATION** of: | |
| | Ozluturk et al. |
| **Application No.:** | Not Yet Known |
| **Filed:** | Not Yet Known |
| For: | CODE DIVISION MULTIPLE ACCESS (CDMA) COMMUNICATION SYSTEM |
| Group: | Not Yet Known |
| Examiner: | Not Yet Known |

Our File: I-2-91.11US

Date: January 18, 2001

## PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to the initial Office Action, Applicants respectfully request that the application be amended as follows:

### IN THE TITLE

Please delete "CODE DIVISION MULTIPLE ACCESS (CDMA) COMMUNICATION SYSTEM" and insert therefor --MEDIAN WEIGHTED TRACKING FOR SPREAD-SPECTRUM COMMUNICATIONS--.

### IN THE CLAIMS

Please cancel claim 1 without prejudice.

Please add the following new claims:

--2. An improvement for tracking a spreading code in a multipath environment generating a plurality of multipath signals used in a code division multiple access (CDMA) tracking circuit requiring an error signal, the improvement comprising:

an analog-to-digital converter for sampling an input signal having spread-spectrum modulation, with the spreading code embedded in the spread-spectrum modulation having a plurality of chips, with the analog-to-digital converter forming half-chip offset samples and grouping an even set of the half-chip offset samples into an early set of samples, and alternatively grouping an odd set of the half-chip offset sample into a late set of samples;

a first correlation-bank, adaptive-matched filter, coupled to said analog-to-digital converter, for multiplying each early set of samples by the spreading code c(n+1), c(n+2), ..., c(n+L), where L is small compared to the length of the spreading code and approximately equal to the number of chips of delay between the earliest and latest multipath signals, thereby generating a first plurality of products;

a first sum-and-dump bank, coupled to said first correlation bank, adaptive-matched filter, for computing a first plurality of sums from the first plurality of products, respectively;

a first plurality of calculators, coupled to said first sum-and-dump bank, for calculating a first plurality of magnitudes from the first plurality of sums, respectively;

a first summer, coupled to said first plurality of calculators, for summing the first plurality of magnitudes to generate an early signal-energy value;

a second correlation-bank, adaptive-matched filter, coupled to said analog-to-digital converter, for multiplying each late set of samples by the spreading code c(n-1), c(n-2), ..., c(n-L), thereby generating a second plurality of products;

a second sum-and-dump bank, coupled to said second correlation bank, adaptive-matched filter, for computing a second plurality of sums from the second plurality of products, respectively;

a second plurality of calculators, coupled to said second sum-and-dump bank, for calculating a second plurality of magnitudes from the second plurality of sums, respectively;

a second summer, coupled to said second plurality of calculators, for summing the second plurality of magnitudes to generate a late signal-energy value; and

a subtractor, coupled to said first summer and to said second summer, for calculating a difference between the early signal-energy value and the late signal-energy value, thereby producing the error signal.

3. An improvement for tracking a spreading code in a multipath environment generating a plurality of multipath signals, used in a code division multiple access (CDMA) tracking circuit requiring an error signal, the improvement comprising the steps of:

sampling an input signal having spread-spectrum modulation, with the spreading code embedded in the spread-spectrum modulation having a plurality of chips;

forming half-chip offset samples from the sampled input signal;

grouping an even set of the half-chip offset samples into an early set of samples;

grouping, alternatively, an odd set of the half-chip offset samples into a late set of samples;

multiplying each early set of samples by the spreading code c(n+1), c(n+2), ..., c(n+L), where L is small compared to the length of the spreading code and approximately equal to the number of chips of delay between the earliest and latest multipath signals, thereby generating a first plurality of products;

computing a first plurality of sums from the first plurality of products, respectively;

calculating a first plurality of magnitudes from the first plurality of sums, respectively;

summing the first plurality of magnitudes to generate an early signal-energy value;

multiplying each late set of samples by the spreading code c(n-1), c(n-2), ..., c(n-L), thereby generating a second plurality of products;

computing a second plurality of sums from the second plurality of products, respectively;

calculating a second plurality of magnitudes from the second plurality of sums, respectively;

summing the second plurality of magnitudes to generate a late signal-energy value; and

calculating a difference between the early signal-energy value and the late signal-energy value, thereby producing the error signal.

4. An improvement for tracking a spreading code in a multipath environment generating a plurality of multipath signals, used in a code division multiple access (CDMA) tracking circuit requiring an error signal, the improvement comprising:

sampling means for sampling an input signal having spread-spectrum modulation, with the spreading code embedded in the spread-spectrum modulation having a plurality of chips, with an analog-to-digital converter forming half-chip offset samples and grouping an even set of the half-chip offset samples into an early set of samples, and alternatively grouping an odd set of the half-chip offset sample into a late set of samples;

first correlation means for multiplying each early set of samples by the spreading code c(n+1), c(n+2), ..., c(n+L), where L is small compared to the length of the spreading code and approximately equal to a number of chips of delay between the earliest and latest multipath signals, thereby generating a first plurality of products;

first sum-and-dump means for computing a first plurality of sums from the first plurality of products, respectively;

first calculator means for calculating a first plurality of magnitudes from the first plurality of sums, respectively;

first summer means for summing the first plurality of magnitudes to generate an early signal-energy value;

second correlation means for multiplying each late set of samples by the spreading code c(n-1), c(n-2), ..., c(n-L), thereby generating a second plurality of products;

second sum-and-dump means for computing a second plurality of sums from the second plurality of products, respectively;

second calculator means for calculating a second plurality of magnitudes from the second plurality of sums, respectively;

second summer means, coupled to said second calculator means, for summing the second plurality of magnitudes to generate a late signal-energy value; and

subtractor means for calculating a difference between the early signal-energy value and the late signal-energy value, thereby producing the error signal.--

## IN THE ABSTRACT

Please delete the current abstract, and substitute the following abstract therefor:

--An improvement for a method and system for tracking a spreading code, used in a code division multiple access (CDMA) system. An input signal has spread-spectrum modulation. The spreading code embedded in the spread-spectrum modulation has a plurality of chips. The input signal is sampled, and half-chip offset samples are formed from the sampled input signal. An even set of the half-chip offset samples are grouped into an early set of samples, and an odd set of the half-chip offset samples are grouped into a late

set of samples. Each early set of samples is multiplied by the spreading code c(n+1), c(n+2), ..., c(n+L), to generate a first plurality of products. L is approximately equal to the number of chips of delay between the earliest and latest multipath signals. A first plurality of sums and magnitudes are computed from the first plurality of products. The first plurality of magnitudes are summed to generate an early signal-energy value. Each late set of samples is multiplied by the spreading-code c(n-1), c(n-2), ..., c(n-L), thereby generating a second plurality of products. A second plurality of sums and magnitudes are computed from the second plurality of products. The second plurality of magnitudes are summed to generate a late signal-energy value. A difference is calculated between the early signal-energy value and the late signal-energy value, thereby producing an error signal.--

## REMARKS

By this Preliminary Amendment, Applicants cancel claim 1 and add new claims 2-4; amend the title; and amend the abstract. Entry of this Amendment and prompt allowance of the pending claims is respectfully requested.

Respectfully submitted,

Ozluturk et al.

By_____
Gerald B. Hart, Jr., Esquire
Registration No. 37,633
(215) 568-6400

Volpe and Koenig, P.C.
Suite 400, One Penn Center
1617 John F. Kennedy Blvd.
Philadelphia, PA 19103
GBH/kag